

Macoma secta var. edulis Nutt.	Lacuna unifasciata Cpr.
Pholadidea ovoidea Gould	Lacuna solidula Sby.
Semele rubiolineata "auct. non Conrad"	Muricidea californica Hinds
Venerupis lamellifera Con.	Murex trialatus Sowerby
<i>Gasteropoda</i>	Ocinebra lurida Midd. var. aspera Bairs
Acmaea insessa Hinds (Na- cella insessa Hinds)	Tegula montereyi Kien (Chlorostoma pfeifferi Phil.)
Acmaea instabilis Gld. (Na- cella instabilis Gld.)	Thais lamellosa var. ostrina Gould
Acmaea triangularis Cpr. ¹	
Fissuridea murina Dall (Gly- phis densiclathrata Rve.)	

Species collected by W. M. Wood at Bolinas Bay and not found in the Pacific Conchological Club collections or in the list given by Stearns.

<i>Amphineura</i>	Saxicava arctica Linn.
Mopalia hindsii	<i>Gasteropoda</i>
<i>Pelecypoda</i>	Crepidula navicelloides Nut- tall (C. nivea Gould)
Entodesma saxicola Baird	Haliotes fulgens Phil.
Kellia laperousii Deshayes	Hipponyx tumens (Amalthea tumens Cpr.)
Lithophagus plumulata Hanl.	Margarites pupilla Gould
Lyonsia californica Conrad	
Mytilimeria nuttalli Conrad	
Pholadidea parva Tryon	

STUDIES IN NAJADES.

BY A. E. ORTMANN.

(Continued from page 22.)

LEXINGTONIA nov. gen.

Shell subquadrate or subtrapezoidal, with slightly elevated beaks, and well developed hinge teeth. Beaks not much an-

¹ According to Keep probably a variety of *A. paleacea* Gld.

terior. Outer surface without sculpture. Epidermis lighter or darker brownish, with rather indistinct rays, which are narrower or wider, and do not break up into blotches. Beak sculpture distinct, consisting of rather numerous (six to eight), rather crowded, subconcentric ridges, which form an indistinct, rounded angle upon the posterior ridge, and are in front of this somewhat wavy and corrugated, but without showing any distinct zigzag pattern. Toward the disk, they disappear. Nacre whitish or pinkish.

Soft parts more or less orange. Anal separated from the supraanal by a well-developed mantle connection, which is shorter than the anal. Anal with small, but distinct papillae, branchial with somewhat larger papillae. Inner lamina of inner gills free. Only the outer gills are marsupial in the female, when gravid, they swell but little, and the placentae are subcylindrical (not compressed and lanceolate), rather solid, and of red color. Glochidia semielliptical, of medium size, without hooks.

Type: *Unio subplanus* Conrad.

This genus stands near *Pleurobema* and *Elliptio*, and differs from either chiefly by the subcylindrical, red placentae, and by the beak sculpture. The placentae resemble much those of *Fusconaja*, but this genus has all four gills marsupial, and the beak sculpture is much more simple. In the beak sculpture, *Lexingtonia* is peculiar, and might even be said to approach *Rotundaria*. The general shape of the shell much resembles that of *Fusconaja rubiginosa* (Lea). *Lexingtonia* apparently is a collective type, uniting characters found in several other genera, with one character of its own (beak sculpture), and thus the best way out of the difficulty is to create a new genus, which stands between *Fusconaja* on the one side, and *Pleurobema* and *Elliptio* on the other.

LEXINGTONIA SUBPLANA (Conrad). (*Unio subplanus* Conrad, Monogr. Union. 9, 1837, p. 73, pl. 41, f. 1, from "branch of James River" (=North River), Lexington, Rockbridge Co., Va.—Simpson, Pr. U. S. Mus., 22, 1900, p. 720: "North Carolina and Virginia").

I found seven specimens of this species. One was found at

the type-locality on June 7, 1912, and proved to be a gravid female, with the glochidia fully developed. The others were found about 7 or 8 miles below in North River, above Buena Vista, Rockbridge Co., Va.: 2 males, 2 sterile, and 2 gravid females, one of the latter with eggs, the other with the glochidia just beginning to form. The largest is a male, length 40.5, height 27.5, diameter 13.5 mm., the next largest, a female, measures, length 40, height 27, diameter 15 mm.

The shape of the shell is somewhat variable: Conrad's figure represents a rather long specimen; I have such specimens, but others are shorter. The figure shows no trace of rays, but sometimes these are rather distinct.

In Simpson's system (l. c., pp. 719-720), this species forms the group of *U. striatulus*, together with three others: *striatulus* Lea, *amabilis* Lea, and *brimleyi* Wright. I have no doubt that these are indeed closely allied, and should not be astonished, if they finally should prove to be all the same species. Of *striatulus* and *brimleyi* I am rather strongly inclined to think that is the case.

The essential characters of the soft parts have been mentioned in the description of the genus. It should be noted that the mantle connection between anal and supraanal is present in all of my specimens, and although shorter than the anal, is better developed than in the species of *Fusconaja*, *Quadrula*, *Plethobasus*, and *Pleurobema*. The comparatively distinct papillae of the anal should also be noted.

The color of the abdominal sac and the gills is grayish-white; foot paler or darker orange, adductors pale orange. The charged outer gills of the gravid female are bright red (like those of *Fusconaja rubiginosa*). Also the gonads are red. Placentae subcylindrical, sometimes very slightly compressed, but only near the base; they are rather solid and can easily be taken out entire, even when glochidia are present.

Glochidia semielliptical, without hooks. Length and height the same, 0.18 mm.

PLEUROBEMA FRIERSONI (B. H. Wright) (See: *Quadrula fr.* Simpson, 1900, p. 787).

A number of specimens of typical *frierisoni* were received

from L. S. Frierson, collected August 1, 1912, in Sabine River, Logansport, De Soto Par., La.

Others were sent by H. E. Wheeler from the Ouachita River, Arkadelphia, Clark Co., Ark., collected at various dates. Among them were two gravid females, collected May 19, 1911, one with eggs, the other with unripe glochidia.

The specimens from Ouachita River are not typical *frier-soni*, but resemble this species greatly; they are quite variable in shape, but in the average more oblique. Whatever they are, the anatomy of these two forms is identical.

The structure of the soft parts is that of the genus *Pleurobema*, with the outer gills only marsupial. The placenta are lanceolate and compressed. Glochidia not fully mature, but their shape could be made out; they are semielliptical, higher than long, approximate size, length 0.13, height 0.15 mm.

The soft parts seem to have been whitish in all.

This species belongs near to *P. riddelli*, as described by me previously (l. s., p. 262). I first thought they were this species, till Mr. Frierson called my attention to *frier-soni*, and I think he is right. Whether the specimens from Jackson, Miss., are actually *riddelli*, remains to be seen.

PLEUROBEMA FASSINANS (Lea) (See: Simpson, 1900, p. 762).

A number of specimens from North Fork Holston River, Saltville, Smyth Co., Va., collected by myself on September 17, 1912.

Anal opening separated from the supraanal by a short mantle-connection, its inner edge with fine papillae. Branchial with larger papillae. Posterior margins of palpi connected for about one-half of their length. Inner lamina of inner gills free from abdominal sac, except at anterior end. In the female (many were examined) only the outer gills are marsupial, having much more crowded septa than the inner gills. No gravid females were found.

In all specimens, the soft parts were grayish-white to pale-brown; in one case, foot and adductor muscles have been marked as orange-brown. None of the shells has been marked as having had red gonads.

The natural affinities of this species remain yet to be investigated. It seems to be a true *Pleurobema*, but represents, in the shell, a peculiar type, which has no closer relation to any of those, of which the soft parts are known.

ELLIPTIO LANCEOLATUS (Lea) (See: *Unio lanc.*, Simpson, 1900, p. 734).

I collected, on June 3, 1912, two specimens, one a gravid female, in Mountain Run, Culpeper, Culpeper Co., Va., and about a dozen, part of them gravid, on June 5, 1912, in Rapidan River, Rapidan, Culpeper Co., Va. All gravid females had eggs, and thus the beginning of the breeding season falls probably in May.

Structure of soft parts identical with that of *E. complanatus*, and chiefly with *E. productus*, agreeing with the latter in the rather long mantle-connection between anal and supra-anal (almost as long as anal). (See: Ortmann, 1812, p. 270.) Structure of marsupium in the gravid female as described in *E. complanatus*; only the outer gills are marsupial, the eggs are whitish, forming rather distinct, lanceolate and compressed placentae.

UNIO PICTORUM (Linnaeus) (See: Ortmann, 1912, p. 274).

In 1911, I have received from W. Israël a number of gravid specimens from Germany. They were collected on May 12, 15, 22, 27, and 28, 1911. Some of those collected on May 22, 27, and 28 had glochidia, and on May 22 some were in the act of discharging.

The investigation of the marsupium shows that the outer gills are only moderately swollen, when charged, and that the edge remains sharp and is not distended. The eggs form lanceolate and compressed placentae, which are not very solid, and when glochidia are developed, there is no or very little cohesion between them; they fall easily apart and pass out of the suprabranchial canals in loose, irregular masses. No traces of lateral water canals have been observed, and the ovisacs remain open below.

The glochidia are of the *Anodonta*-type, as was known

before, being subtriangular in outline, and having hooks. But they are rather small, length and height being about equal, 0.21 mm. This is entirely at variance with the statement of Harms (Zool. Jahrb. Anat., 28, 1909, p. 332) and Haas (Pr. Malacol. Soc. London, 9, 1910), quoted in my text, p. 275, that they are 0.29 mm. long. But possibly this is simply a slip of the pen or a misprint.

UNIO TUMIDUS Retzius.

I have gravid specimens, received from W. Israël, collected in Germany on May 22 and 27, 1911. One of the first date had unripe glochidia.

The structure of the soft parts is exactly like that of *U. pictorum*. The glochidia are immature, and the hooks are not yet developed. In general shape they resemble much those of *U. pictorum*, but they seem to be smaller, 0.19 mm.; but this should be confirmed by the measurements of ripe glochidia.

UNIO CRASSUS Retzius.

W. Israël sent me gravid females from Germany, collected on May 2, 12, 25, 26, and on June 6 and July 21, 1911. Glochidia were found in specimens collected on May 26 and June 6, on the latter date they were being discharged. In addition, a single gravid female with eggs was collected on December 24, 1910, but this is regarded by W. Israël as an exceptional case. Also the date July 21 appears as somewhat abnormal. The normal breeding season apparently lasts from April to June.

Also here the structure is similar to that of *U. pictorum*. Placentae distinct only, when eggs are present, and not very solid. In the discharging female the glochidia were in the suprabranchial canals in loose, irregular masses. Glochidia of the same shape as in *U. pictorum*, but slightly smaller, and less high in proportion to length; length 0.19-0.20, height 0.18-0.19.

THE WATER CANALS IN THE MARSUPIUM OF THE ANODONTINAE.

Lefevre and Curtis (Bull. Bur. Fisher, 30, 1912, p. 133) regard the lateral or secondary water canals ("respiratory

canals'') of the charged marsupium of the *Anodontinae* as a special device for aëration, not of the embryos, as I believe, but of the blood of the gravid female, the mother. Their argument is, that it is hard to see that a canal shut off from the embryos by a membrane could increase the facilities of aëration. I think, this argument rests upon a complete misunderstanding of the requirements and actual conditions; a canal, which permits a circulation of water within the gill, although separated from the embryos by a thin membrane, surely gives a better chance for aëration of the embryos, than the complete absence of such a canal, and, consequently, the complete absence of any water circulation within the marsupial gill. The mass of embryos inside of the water tubes is of such a character, that it would completely choke up the ostia, and there would be only a water current over the outer faces of the gill, separated from the embryos by the whole thickness of the gill-lamina, which is considerable. For this reason, I emphatically must maintain my first opinion, that the lateral water tubes have the function of furnishing breathing water for the embryos and glochidia, and not for the mother.

(To be continued.)

A. C. BILLUPS.

Mr. A. C. Billups died early in June at his home in Lawrenceburg, Indiana. He was known to conchologists as an ardent collector of shells, his chief interest being in fresh-water species. Besides his conchological work, Mr. Billups was known as an entomologist, a pursuit in which he took especial delight and satisfaction. In his business as a mechanical engineer, Mr. Billups traveled extensively for a time, installing power plants of various kinds; and this gave many opportunities for collecting in those branches of natural history which interested him. It also gave opportunities for personal intercourse with brother naturalists, many of whom will hear of his death with sincere sorrow. Mr. Billups is survived by his wife and son, Mr. C. F. Billups.